

Work Order ID 83280

83280

U/R

Page 1

April-16-12 2:28:14 PM

Item ID: D350-748-141TRN

Accept

N9000040100

Setup Start *NS1*

Revision ID: U/R

Item Name: Crosstube Turning Detail

Stop *NS2*

Start Date: 16/04/2012 Start Qty: 1.00 *1*

Cust Item ID:

Required Date: 30/04/2012 Req'd Qty: 1.00 *1*

Customer:

Reference:

Approvals: Process Plan: *MLJ*

Date: *12/04/16* Tooling:

Date:

Run Start *NR1*

QC:

Date: SPC (Y/N):

Date:

Stop *NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr

Revision Nbr

D350-748-141

F U/R

12-4-16

0.00

100

MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs on both ends as per Folio FA648

2-Turn first side as per Folio FA648

3- File transition lines smooth.

FOLIO REV: _____

DWG REV: _____

KC 12-4-25

110

QC1- Inspect dimensions to dimension sheet

0.00

110

QC

Memo

0.00

Quality Control

KC 12-4-25

mcm.l

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Work Order ID 83280

83280

Page 2

April-16-12 2:28:14 PM

Item ID: D350-748-141TRN

Accept

N900040100

Setup Start ***NS1***

Revision ID: U/R

Item Name: Crosstube Turning Detail

Stop ***NS2***

Start Date: 16/04/2012 Start Qty: 1.00

1

Cust Item ID:

Required Date: 30/04/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan:

Date:

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

120

0.00

120

MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Turn second side as per Folio FA648
2- File transition lines smooth.
3-Scribe Part & Batch as per Dwg D350-748-141
FOLIO REV: _____
DWG REV: _____

KE 12-4-25

130

QC1- Inspect dimensions to dimension sheet

0.00

130

QC

Memo

0.00

Quality Control

*mml
12/04/20*

140

QC8- Inspect parts - second check

0.00

140

QC

Memo

0.00

Quality Control

DP 12-4-30

Dart Aerospace Ltd

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Required Date: 30/04/2012 Req'd Qty: 1.00 *1*

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Reference:

Approvals:	Process Plan:	Date:	Tooling:	Date:	Run Start *NR1*
	QC:	Date:	SPC (Y/N):	Date:	Stop *NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

150

150

Crosstubes

Large Fab

0.00

Memo

0.00

Crosstubes

Grind machining marks

RM
12-5-2

160

160

Outsource

Outsource process - Heat Treat

0.00

Memo

0.00

Outsource process - Heat Treat

Issue P/O: *16899*
Heat Treat to min 180 KSI As per Dwg D350-748-141
(MIL-T-6736 OR AMS 2759-1C)
Sand Blast tube after Heat Treat
Possible Supplier: Vac Aero
Ensure Certificate of Conformity is attached

11/205-3

170

170

Packaging

Receive & Inspect for Damage & Mat'l Certs

0.00

Memo

0.00

Packaging

Ensure certificate of conformaty is attached

P12/8/2

Dart Aerospace Ltd

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Page 4

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Required Date: 30/04/2012 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: Date:

Tooling: Date:

Run Start ***NR1***

QC: Date:

SPC (Y/N): Date:

Stop ***NR2***Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

180

QC6- Inspect dimensions to drawing

0.00

180

QC

Memo

0.00

Quality Control



12/10/28

190

Packaging

0.00

190

Packaging

Memo

0.00

Packaging

Identify and stock in kanban rack
Location: LG

TW 12-09-28

200

QC21- Final Inspection - Work Order Release

0.00

200

QC

Memo

0.00

Quality Control

12/10/5

CL 12/10/28

W/O:		WORK ORDER CHANGES					
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NOTE: Date & initial all entries

DART AEROSPACE LTD	Work Order: 83280
Description: Crosstube Assembly (AS350/355 High Fwd)	Part Number: D350-748-141
Inspection Dwg: D350-748-141 Rev: F	Page 1 of 1

FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+0.005/-0.000	2.244	✓		
	2.180	+0.005/-0.000	2.185	✓		
	2.180	+0.005/-0.000	2.186	✓		
	2.237	+0.005/-0.000	2.242	✓		
	2.272	+0.005/-0.000	2.272	✓		
	2.306	+0.005/-0.000	2.311	✓		
	2.339	+0.007/-0.000	2.344	✓		
	2.339	+0.007/-0.000	2.345	✓		
	0.062	+/-0.010	.062	✓		
	4.26	+/-0.030	4.26	✓		
	R0.063	+/-0.010	.063	✓		
	R0.50	+/-0.030	.50	✓		
SIDE B	2.240	+0.005/-0.000	2.240	✓		
	2.180	+0.005/-0.000	2.184	✓		
	2.180	+0.005/-0.000	2.185	✓		
	2.237	+0.005/-0.000	2.241	✓		
	2.272	+0.005/-0.000	2.276	✓		
	2.306	+0.005/-0.000	2.311	✓		
	2.339	+0.007/-0.000	2.344	✓		
	2.339	+0.007/-0.000	2.345	✓		
	0.062	+/-0.010	.062	✓		
	4.26	+/-0.030	4.26	✓		
	R0.063	+/-0.010	.063	✓		
	R0.50	+/-0.030	.50	✓		
	110.27	+/-0.060	110.27	✓		

Measured by: KC	Audited by: [Signature]	Preliminary Approval:
Date: 12-4-24	Date: 12-4-30	Date:

Rev	Date	Change	Revised by	Approved
A	06.11.09	New Issue (P/O D350-748-101)	KJ/JLM	
B	07.10.24	Dwg Rev updated	KJ/EC/DD	
C	11.01.20	Dwg Rev updated	KJ	
D	11.07.26	Tolerance revised for 2.339 dimensions	KJ	[Signature]

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

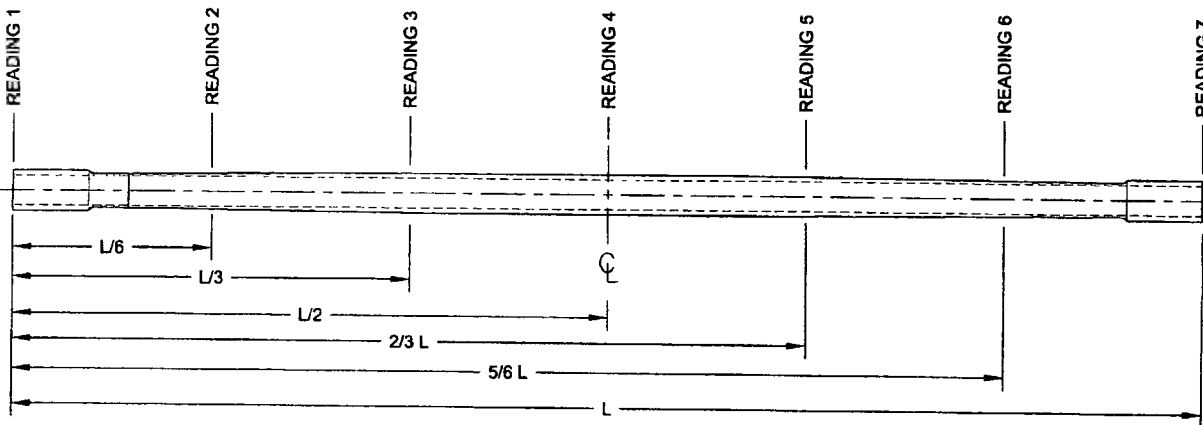
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order:	
Description: Crosstube Assembly (AS350/355 High Fwd)		Part Number:	D350-748-141
Inspection Dwg: D350-748-141 Rev: F		Page 2 of 2	

WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation Δw (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L= 0"	.127	.122	.121	.127	.006	0.030"
READING 2 L=	.147	.138	.130	.134	.017	
READING 3 L=	.178	.184	.176	.171	.013	
READING 4 L=	.180	.181	.169	.171	.012	
READING 5 L=	.181	.182	.173	.173	.009	
READING 6 L=	.138	.136	.137	.139	.021	
READING 7 L=	.125	.128	.126	.126	.001	

Calibration Result

Actual Block Thickness: 100-300

Sitescan 250 Measured Thickness: 100-300

Measured by: <u>KC</u>	Audited by: <u>DP</u>	Preliminary Approval:
Date: <u>12-7-27</u>	Date: <u>12-4-30</u>	Date:

Rev	Date	Change	Revised by	Approved
A	06.11.09	New Issue (P/O D350-748-101)	KJ/JLM	
B	07.10.24	Dwg Rev updated	KJ/EC/DD	
C	11.01.20	Dwg Rev updated	KJ	
D	11.07.26	Tolerance revised for 2.339 dimensions	KJ	
E	12.06.04	Wall thickness form added	KJ	<u>[Signature]</u>

Item	Qty -141	Part Number	Description
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AEIS-1032-225	INSERT
6	1	NAS 1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115
FINISHED LENGTH = 110.270±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 30.45 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT

WITHOUT NOTICE
WORK ORDER
NO. 83280 MLJ
12/04/16

UNDER REVIEW
11.07.12

RELEASED
2011-01-18
NH

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN	92	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN	92		
CHECKED	92	DRAWING NO.	REV. F
MFG. APPR.	92	D350-748-141	SHEET 1 OF 4
APPROVED	92	TITLE	SCALE
DE APPR.	92	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	

Dart Aerospace Ltd

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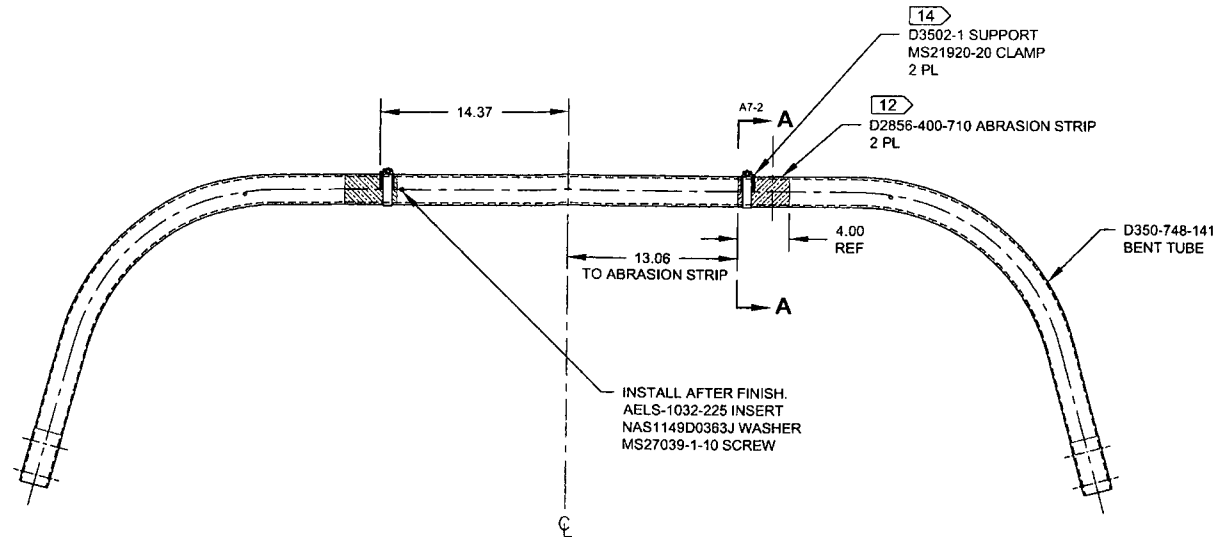
Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

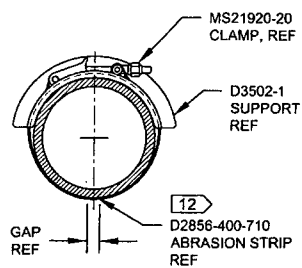
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NOTE: Date & initial all entries

03280



**D350-748-141
ASSEMBLY DETAIL**



SECTION A-A D4-2
SCALE 4X

UNDER REVIEW

11.07.11

RELEASED
2011-01-18

DESIGN	92	DART AEROSPACE LTD	
DRAWN	92	HAWKESBURY, ONTARIO, CANADA	
CHECKED	12	DRAWING NO.	REV. F
MFG. APPR.	12	D350-748-141	SHEET 2 OF 4
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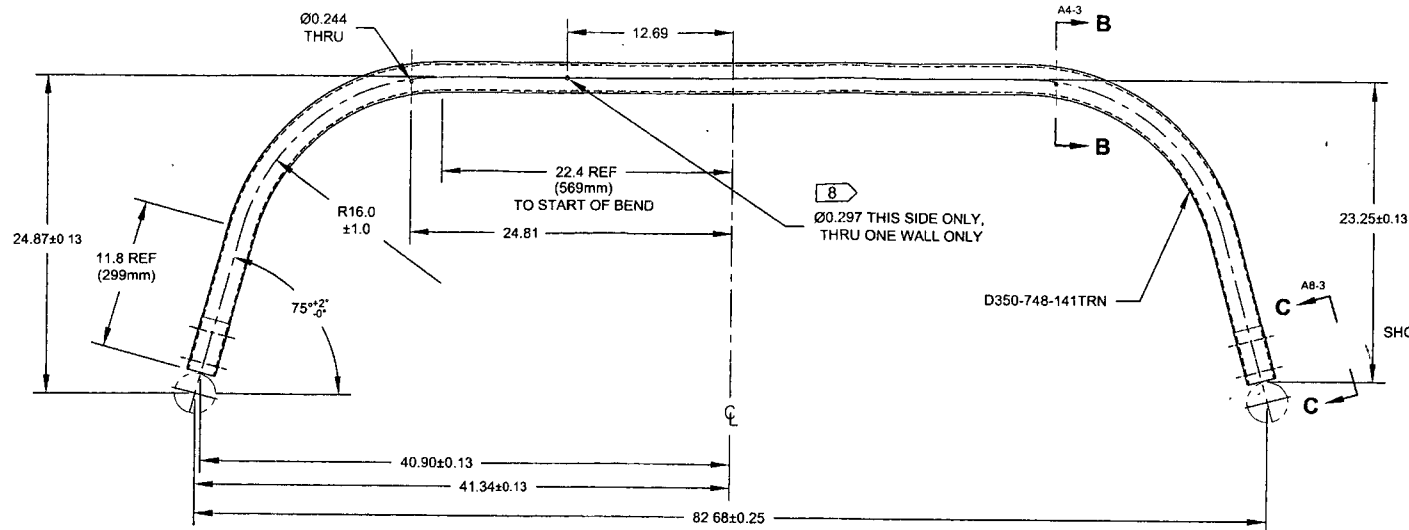
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Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

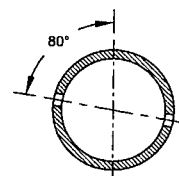
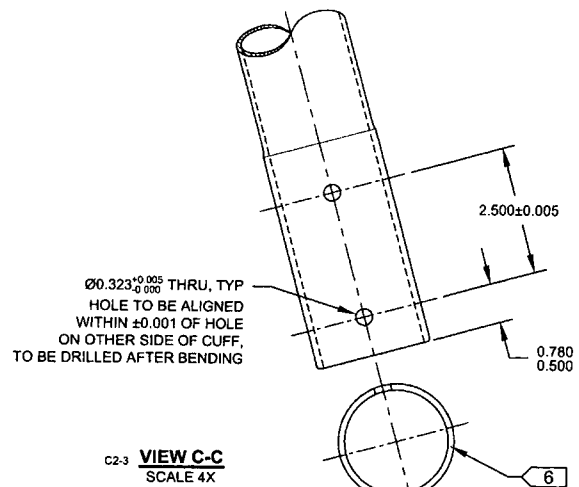
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8 7 6 5 4 3 2 1



D350-748-141
BENDING AND DRILLING DETAIL 10



SECTION B-B D3-3
SCALE 4X

UNDER REVIEW

11.27.12

RELEASED
2011-01-18

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DRAWN	92	HAWKESBURY, ONTARIO, CANADA	
CHECKED	92	DRAWING NO.	REV. F
MFG. APPR.	92	D350-748-141	SHEET 3 OF 4
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8 7 6 5 4 3 2 1

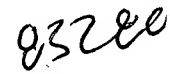
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— SEE DETAIL E
A1-4

11.07.12

RELEASE
2011-01-18

DETAIL E:
TAPER RUN-OFF C3-4
NOT TO SCALE

DETAIL D:
CROSSTUBE CUFF C7-4
SCALE 3X

DETAIL F:
CUFF TRANSITION A5-4
NOT TO SCALE

DESIGN	<i>90</i>	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA DRAWING NO. D350-748-141 TITLE CROSSTUBE (AS 350/355 HI FWD) COPYRIGHT © 2006 BY DART AEROSPACE LTD <small>THIS DOCUMENT IS PRIVATE PROPERTY OF DART AEROSPACE LTD. IT IS NOT TO BE COPIED, REPRODUCED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	REV. 1	
DRAWN	<i>90</i>		SHEET 4 OF 4	
CHECKED	<i>KS</i>			
MFG. APPROV.	<i>ES</i>		TITLE	SCALE
APPROVED	<i>TH</i>		CROSSTUBE (AS 350/355 HI FWD) NT	
DE APPR.	<i>TH</i>			
DATE	10.11.23			

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NOTE: Date & initial all entries



1000 E. Mermaid La., Wyndmoor (Phila.) PA 19038-8093
Tel. (215) 233-2600 Fax (215) 233-5653

Certification

SOLD TO

Dart Aerospace Ltd.
1270 Aberdeen Street
Hawkesbury, ON K6A 1K7

June 5, 2012

Metlab Shop Order No:	72197
Purchase Order:	16899
Description:	Crosstube
Part No.:	D350-748-141TRN, D350-748-241TRN
Quantity:	7 and 4 Pieces, Respectively
Weight:	500 Pounds
Material:	4130 Alloy Steel
Specifications:	Heat Treat to Minimum 180 KSI (MIL-T-6736OR AMS 2759-IC)
Note:	Need HRC 40 - 45

This is to certify that the above parts were processed as indicated above and conform to the specification requirements.

Results:

HRC 45 (218 KSI Tensile Strength, Converted)

METLAB

Quality Representative

Mark Podob

MERCURY CONTAMINATION: During the heat treating process, testing and inspections, the product did not come in direct contact with mercury or any of its compounds nor with any mercury containing device.



Heat Treating and Metallurgical Consulting